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ABSTRACT

This study examined policies to help states develop, recruit, and retain more highly qualified teachers. Researchers conducted interviews to examine the data systems in 14 states. Results indicated that comparable, timely, and accurate data about teacher quality were conspicuously absent from many policy discussions. Although states collected and disseminated a wealth of information on teachers, current efforts tended to be disjointed, episodic, and cross sectional. Results show that states cannot effectively create change in teacher quality without the close involvement of higher education. An effective state data system would enable school districts to recruit teachers based on knowledge of where qualified teachers are located and would provide hard evidence about incentives to attract and retain them. Effective state data systems would also help teachers know about what types of schools have vacancies matching their qualifications. Results suggest that to understand the teacher pipeline, states must collect data on preservice and alternative certification programs, teacher employment, licensed teachers not currently working, and teacher retention. Four appendixes present panelists, state profiles, data elements to manage teacher quality, and the National Advisory Committee on Teacher Mobility. (Contains 10 references.) (SM)

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Data Systems to Enhance Teacher Quality

Richard A. Voorhees
and
Gary T. Barnes

with
Robert Rothman

July, 2003

SHEEO

PREFACE

Data Systems to Enhance Teacher Quality

This monograph, supported by grants from the Ford Foundation and the Carnegie Corporation of New York, is part of larger efforts to examine policies that will help states develop, recruit, and retain more high quality teachers. Three years ago policy analysts working for the National Governor's Association and the National Conference of State Legislatures found that state policy makers struggling with these issues lack important information to diagnose problems and develop effective policies. Policy makers want and need better information about the qualifications, preparation, and career paths of people licensed to be teachers, about turnover and recruitment patterns, and about the supply of and demand for teacher talent.

This study examined the data systems in 14 states to learn whether it is possible to improve what we know about such questions. Surprisingly, perhaps, the authors discovered that much of the critical information already exists, but that it is buried in the nooks and crannies of different data bases – data bases maintained by schools and colleges, by state licensing boards, by state unemployment insurance agencies, et al.

By enhancing the utility of these sources of information and bringing them together cost effectively, states can better answer important questions about the attractiveness of teaching as a profession and about recruiting and retaining stronger teachers. This may not be an easy task - it could require unprecedented cooperation among different agencies, and it will require handling the issues of cost and privacy responsibly. States are finding innovative ways of dealing with these issues, however, and this study of 14 state data systems will be a useful resource to all interested in enhancing teacher quality and educational policy.

Thanks are due to the participating states and to the Ford Foundation and the Carnegie Corporation for their support of the Teacher Mobility Project, jointly administered by SHEEO and the Educational Commission of the States. Thanks also to the advisory committee of that project, and to the advisory panel who assisted the authors of the study. Their names are listed in the Appendices. We hope you find it helpful.

Sincerely,

Paul E. Lingenfelter
Executive Director
State Higher Education Executive Officers

Ted Sanders
President
Education Commission of the States

Authors' Biographies

Dr. Richard A. (Rick) Voorhees has been a teacher at the elementary, junior high, college, and graduate school levels. His administrative background includes appointments in academic, student services, and research and policy capacities at tribal colleges, suburban community colleges, inner-city colleges, rural comprehensive universities, major research universities, governing boards, and at the national policy level. He has been invited to work in various capacities with the U.S. Department of Education, the National Center for Educational Statistics, Educational Testing Service, the American Association of Community Colleges, the Association of Community College Trustees, the Higher Learning Commission of the North Central Association, the American Indian College Fund, the National Governors Association, the National Association of College and University Business Officers, the State Higher Education Executive Officers, and the American Council on Education. In 2003, he served as President of the Association for Institutional Research. Rick is the principal and senior researcher at the Voorhees Group, an independent consulting firm located in Littleton, Colorado.

Gary T. Barnes has worked, since January 2002, as a consultant in the area of educational policy analysis and related data requirements and structures. His work on teacher quality has included a comprehensive study of teacher supply and demand in North Carolina in 1986; annual reports to the North Carolina General Assembly on the supply of, and demand for, principals and assistant principals in North Carolina public schools; alternative methods of calculating pass rates on PRAXIS exams, and analyses of teacher turnover rates and teacher supply for the Southeast Center for Teaching Quality. From 1996-2002, he served as Vice President for Program Assessment and Public Service in the University of North Carolina Office of the President, having responsibility for institutional accountability, assessment, performance budgeting, data reporting, institutional research, tuition and student financial aid policy and academic policies related to college access, and public service. For 17 years prior to serving as vice president, he served as a planning officer in the Office of the President, having responsibility for institutional and system-level research; coordination of research with public schools, community colleges and other state agencies; projecting enrollments for long range planning and budgeting; and conducting special studies for the legislature and the UNC Board of Governors. Between 1972 and 1979, he served as a faculty member in the Department of Economics at the University of North Carolina in Greensboro where he taught statistics and economics. Throughout his career he has consulted extensively for states, institutions, and other educational agencies.

Robert Rothman is a Principal Associate for the Annenberg Institute for School Reform and the editor of its series of occasional papers, Voices in Urban Education. He has written for numerous education publications and organizations and was a reporter and editor for Education Week. Rothman was also a senior project associate for Achieve, a study director for the National Research Council, and the director of special projects for the National Center on Education and the Economy. He is the author of Measuring Up: Standards, Assessment and School Reform (Jossey-Bass Publishers Inc., 1995) and numerous book chapters and articles on testing and education reform.

Executive Summary

Highly qualified teachers must be employed in every classroom in the United States by the end of the 2005-06 school year. States will have to work hard over the next few years to meet this requirement of the No Child Left Behind Act and to ensure that such teachers are available in many schools and in many subjects. States that have high quality data systems will be able to direct their efforts to meet this challenge more efficiently. Based on interviews in 14 states, this report examines the role of state data systems on teachers in helping states reach that goal.

A state's teacher force can be compared to the staff of a very large corporation in a knowledge industry. Imagine what such a corporation would do if it lacked information to answer questions such as these:

- Where do we get our very best professional employees? What courses did they take, how did they do, what kinds of preparation seem to really help them perform on the job?
- Are our professional employees working where they are most needed? If not, how can we meet those needs?
- Where do we have turnover? What is driving it? What can we do to reduce turnover and make better use of our best people?
- Where do we have difficulty recruiting the employees we need? Where might we find good people to fill these positions, and what will help us keep them?
- Do well-qualified people live in our communities whom we are not recruiting successfully? What will it take to get them to join us?

Many states are not able to answer these questions about their teacher force. Some of these questions require information that might not be available from a high quality teacher data system, but none of them can be answered without one.

Key observations from this study include:

- Comparable, timely and accurate data about teacher quality are conspicuously absent from many policy discussions, particularly when those discussions are held at the state or regional level.
- Although states collect and disseminate a wealth of information on teachers, current efforts tend to be disjointed, episodic and cross sectional. The result is that information to create and improve policy is often inadequate.
- States cannot effectively bring about changes in teacher quality without the close involvement of higher education. Higher education agencies and institutions are the best source for information about who enters and who completes teacher preparation programs and the curricular content that prepares new teachers to meet state licensure requirements and the demands of the classroom.
- An effective state data system would enable school districts to recruit teachers based on knowledge of where qualified teachers are located and would provide hard evidence about the incentives that would attract and retain them.
- Effective state data systems also would assist teachers to know about what types of schools have vacancies that match their qualifications and might also provide richer detail about the characteristics of those schools and their students than is now available.

- To understand the teacher "pipeline," states need to collect data about:
  - Teacher-education programs
  - Alternative certification programs
  - Teacher employment databases
  - Licensed teachers not currently teaching
  - Teacher retention
- Information that would provide a complete picture of a state's teacher workforce could be gathered from these databases.
  - Completer Database
  - Assignment Database
  - Employment Database
  - Licensure/Certification Database
  - Student Database
  - Schools Database (including county-level Census Data)
  - Retirement System Database
  - Unemployment Insurance Database
- To develop effective data systems, a high degree of cooperation among key players is critical. Governors and legislative leaders must encourage and support the involvement of all necessary parties in the data-development and collection effort.
- To meet challenges in managing teacher quality, states should commit the financial and human resources necessary to develop and maintain an integrated teacher data system. Making better use of existing resources, as well as supplementing them where needed can pay big dividends.
- States should make the data from integrated systems available for independent research and analysis. Among the best ways to ensure that systems are efficient is to publicly publish data that is collected.
- Although the use of Social Security numbers raises concerns about privacy, states should use such numbers in establishing a data system, while maintaining "firewalls" to ensure that the information is not used for any purpose other than informing policy to enhance the teacher workforce.

Strengthening the quality and attractiveness of the teaching profession is clearly one of our nation's highest priorities. Without better data systems we cannot know what we need to do, how to improve what we are doing, or whether we have succeeded.

The Need for an Effective Data System on Teachers

Enhancing teacher quality is a daunting task even if a state and its school districts have good information about their teachers. Unfortunately, hard data are conspicuously absent in most policy discussions about teacher recruitment, retention, and mobility. Efforts to coordinate the flow of information about the profession are rare within states and even scarcer between states. To be sure, states collect and disseminate a wealth of information on teachers. But such efforts tend to be incomplete and sporadic. States know who is certified to teach, but few states can accurately anticipate demand for teachers or know who is in the "pipeline." They know even less about who has left teaching or why they chose to leave the profession. Getting better data on the human resources of the profession at key points along the pipeline and removing restrictive barriers to mobility that combine to make the profession less attractive are critical. Currently, few states can assess the effectiveness of their policies for preparing, recruiting and retaining teachers, and few can addresses shortages quickly and effectively when they arise.

The United States faces a critical shortage of qualified teachers. Although schools have been able to fill classrooms, few states have high quality data systems in place that will enable them to plan to address gaps in teacher supply and to ensure that every classroom is staffed with a capable teacher. The goal of these data systems would be to fill the information gaps that make it difficult for principals and superintendents to attract and retain the teachers they need and for prospective teachers to know where there is a demand for their services. Without improved information and wide access to that information, it is fair to say that states have done little to move teachers successfully along their career paths, a key step in building a profession that would attract and keep well-qualified people.

A number of institutions are addressing these problems. Colleges and universities, facing growing pressures to train new teachers and demonstrate their success, are revamping teacher preparation programs. Schools, facing intense pressure to raise student performance, are looking at ways of attracting qualified teachers and enhancing the skills of practicing teachers. And state officials, mindful of taxpayers' concerns about education quality, are developing programs to recruit and prepare teachers and to enhance the status of the teaching profession.

The trouble is, few of these efforts are coordinated, and most of them lack a key element: data that will inform good policymaking about the teaching profession. Getting better data on the human resources of the profession at key points along the pipeline and removing restrictive barriers to mobility that serve to make the profession less attractive is critical.

The demand for such information is imperative. The No Child Left Behind Act, the new federal education law, requires schools to employ "highly qualified" teachers in every classroom supported by the federal Title I program this year. Highly qualified teachers must be employed in every classroom in the United States by the end of the 2005-06 school year. The law also requires parents to be notified if their children are taught for four consecutive weeks by teachers who are not "highly qualified." Although states are developing their own definitions of what constitutes "highly qualified" within the parameters set out by federal regulations and guidelines, it is clear that large numbers of teachers in many states will fail to qualify for that designation under any criterion. States will have to work hard over the next few years to make sure that capable teachers are available in many schools.

At the same time, the new law also places strong pressure on states and districts to turn around low-performing schools. Such schools face severe sanctions, including the possibility of replacing the staff or management. To avoid this and improve learning, states and districts will need to strengthen teacher quality in such schools. Yet without a system for managing the supply of well-qualified teachers, states are unlikely to be able to match strengths to the needs of low-performing schools.

To be sure, a data system will not, by itself, solve these problems, nor will it increase teacher quality. But such a system is a necessary first step. We believe that the current imperative to strengthen the quality of the teaching profession requires K12 and higher education leaders to collaborate in producing high quality, efficient data systems both to speed progress and to monitor results. The State Higher Education Executive Officers undertook this study to examine what states are currently doing in building and supporting data systems on teachers. Given the current imperative to strengthen teacher quality such an investigation seems especially timely.

In our view, an effective data system that enhances teacher quality would collect information on teachers throughout their career path. Typically the path begins with a teacher preparation program, meeting state requirements for certification or licensure, employment search, and new teacher induction. It progresses through years of practice, supported by professional development and assessment of one's teaching effectiveness and is sometimes interrupted or terminated prematurely. Along the way teachers may change schools, assignments, or even their occupation. Eventually, the path leads to retirement for those who complete their careers in teaching. For the teacher, these milestones involve important decisions about professional growth and personal satisfaction. For educational policymakers, however, these milestones represent important points of transition that policy levers can address to ensure that every classroom is filled with a highly qualified teacher.

An efficient data system would enable school districts to recruit teachers based on knowledge of where the most qualified teachers are located and would provide hard evidence about the incentives that would attract and retain them. This system would also assist teachers to know about what types of schools have vacancies that match their qualifications and might also provide richer detail about the characteristics of those schools and their students than is now available. Better access to information can help both parties make more efficient decisions throughout the hiring process.

Such a data system can also help solve one of the most vexing problems in education: the highly uneven distribution of qualified teachers. Although nationwide there are enough teachers in the aggregate to fill classrooms, school districts in many states have trouble finding enough teachers at the start of the school year. Often districts are forced to hire many people on "emergency" licenses or hire substitutes whose term often stretches for weeks or months. In particular, specialties such as mathematics and science teachers, or bilingual or special-education teachers, tend to be in short supply. And, of course, many schools are hard to staff due to their location, their poor facilities, their student populations, and their history of low performance. For example, there is considerable evidence that schools serving poor and minority children tend to have the least experienced and least weil-qualified teachers. In one recent study, Richard M. Ingersoll of the University of Pennsylvania found that secondary students in high-poverty schools were twice as likely as students in low-poverty schools to be taught by teachers who are not licensed in the subjects they teach (Education Week, 2003).

All of this might not make much difference if teacher quality were not so important. But in fact, teaching is the most significant school-related variable in student success. Studies in Tennessee, Dallas, and elsewhere have shown that good teachers, compared with bad teachers, can improve student achievement by as much as a grade level over the course of a year. Moreover, the effects of teacher quality are cumulative. Researchers in Dallas found that students assigned to effective teachers for three years in a row went from the 59th percentile in the fourth grade to the 76th percentile in the sixth grade. But a similar group of students, assigned to less-effective teachers, actually lost ground over that period: they went from the 60th percentile to the 42nd percentile (Jordan, Mendro, and Meerasinghe, 1997).

To attempt to rectify the situation and build solid data systems, states do not need to start from scratch. Virtually all states have some information on who their teachers are and where they come from, where they are employed and what they teach, how they are paid and when they can retire, how well they have been trained and how they are certified, whether they have met minimal requirements for professional development and teaching effectiveness and whether they have left the profession either to work in another occupation or to retire. This information is collected by institutions of higher education and other providers of teacher training, by multiple divisions within state departments of education, by local schools and their districts, by professional practice boards and commissions, by state retirement systems, and by unemployment insurance programs operated by state agencies.

In addition, many states also have information on teachers gleaned from surveys, focus group interviews, exit interviews, and from external retirement providers.

The trouble is, such data are often unconnected or connected only on a "one time" or *ad hoc* basis, and therefore fail to provide a comprehensive, longitudinal view of the teacher career path. And, many states lack key elements in what would be a comprehensive system. As a result, states are working without the benefit of a powerful tool that could help them hire and deploy a highly qualified teaching force. States must develop data systems that provide essential information on a precious resource – qualified teachers who can give students the instruction they need to succeed.

How can a data system help states manage supply of well-qualified teachers?

Building a data system is fundamentally different from maintaining databases. A database is a single set of data that focuses on one unit of analysis, for example, teachers, schools, or students. A data system links databases together to create a wider picture of interrelated information and can go a long way toward helping states understand who their current teachers are, where and how they are employed, what they teach, and how mobile they are. This information could help policy makers evaluate current policies for recruiting and retaining teachers and then decide whether new approaches might be warranted. It could also provide information on the "pipeline" for prospective teachers and the "reserve pool" of people who might be available to teach. Such a system could also inform policymakers and administrators about teacher attrition and suggest ways that teachers might be encouraged to stay in classrooms.

In the long run, a well-designed data system can help strengthen the quality of the teacher corps. For example, a data system could help evaluate the design and effectiveness of recruitment strategies. Most states have in place a number of policies to recruit individuals into teaching. Many will forgive student loans if graduates go into teaching. Others offer mortgage assistance to teachers. Some, such as Massachusetts, give "signing bonuses" to college graduates and mid-career professionals entering teaching. But without information on the characteristics and later mobility of those who enter the profession, states are unable to determine whether their policies are attracting and, more importantly, retaining the individuals they want into teaching.

A good data system could inform policy makers about the age, educational background, previous employment, and certification status of newly employed teachers. It would also allow them to determine if teachers are entering the state from another state, or if they are moving within the state. Ideally, such a data system would capture the years of experience that they were credited in their new positions. Such information could help state and school officials target recruiting efforts and plan to fill these vacancies more effectively.

A data system could also inform administrators and policy makers about the quality and effectiveness of teacher-preparation programs, as federal policy, state report cards, and national accreditation agencies increasingly require. By indicating how many students enter teacher-education programs, how many persist through them, how many graduates pass licensure examinations, and the characteristics of these licensees, the data system could help policy makers determine if their preparation programs are producing an adequate number of qualified graduates. By indicating how many graduates enter the profession, remain in the profession (especially in schools that tend to have high rates of turnover), and succeed with their students, the data system could help policy makers learn what kinds of preparatory experience meet the most critical needs for high quality teachers. At the same time, a data system could provide similar information about the number and characteristics of teachers who earn credentials through alternative routes, a comparison to help shed light on the quality and effectiveness of those programs. Both sets of data could suggest changes to ensure that states are producing highly qualified teachers on a cost-effective basis.

While data on the current teacher force are informative, another largely untapped source of information – data on individuals who have left teaching – would also provide important indications about teacher policy. In every state, large numbers of certified teachers leave their schools, or leave the profession entirely, every year. Yet for the most part, states know little about them-where they are working, why they may have left, or what states could do to recruit them back into their classrooms. Groundbreaking research seeking to pinpoint mobility factors has been performed in four states (Theobald and Michael, 2001) but these findings await national confirmation. In the meantime, state data systems that might routinely provide this confirmation are largely undeveloped.

States could learn a great deal from information on how many certified teachers are currently teaching in other schools (out of state, or in private schools), how many are working in other fields and at what salary, and how many are not employed. Another important source of information is on individuals who are qualified to teach but chose not to go into the classroom at all. Where are they currently employed, and at what salary? Will they eventually enter the profession?

Similarly, an efficient data system could pinpoint teacher retention within a particular state. Nationally, 39 percent of new teachers leave teaching within five years, according to a recent study using the federal Schools and Staffing Survey data (Ingersoll, 2002). Within individual states, however, the attrition rate varies from year to year and should be the focus of systematic evaluation. In Tennessee, for example, 16 percent of new teachers left the Tennessee work force left after their first year and this rate varies from 11 percent to 17 percent each year (Cornett, 2001). Oklahoma recently found its attrition rate for new teachers to be 13 percent but that this rate varied by their assigned teaching area and years experience (Oklahoma State Regents for Higher Education, 2002). High school foreign language teachers experienced a 31 percent attrition rate while 8 percent of new early childhood teachers left after one year. Oklahoma teachers with 4 to10 years experience had attrition rates of 7 percent while those with between 11 and19 years experience had averaged 4 percent attrition. A recently completed study of teacher turnover in 9 southern states by the Southeast Center for Teaching Quality (2002) indicates teacher turnover approaches 75 percent as the proportion of free and reduced price meals increases within a given school. It is clear that the teacher attrition rate is complex and that each state should know its unique rate and trends. How much do they vary within a state and across state boundaries? How many teachers leave after achieving vesting status in the state retirement system – an important clue to why teachers stay or go? How many leave for other teaching positions, and where do they go? How many return to teaching, and after how long an absence?

States also need information on what might attract teachers to schools so they can adopt policies to retain teachers or encourage them to move to schools that need them. Information on how many teachers move from district to district or school to school, as well as information on "difficult-to-staff" schools that have succeeded in attracting a highly qualified workforce, could help policy makers make appropriate judgments about such policies. Finally, states need information about the associations between teacher characteristics and student achievement. Such information could also help to shed light on the impact of teacher turnover on performance.

In short, a comprehensive database that connects data on the preparation, certification, recruitment, employment, course assignments, professional development, instructional success, career interruption, turnover, return to teaching, and eventual retirement of teachers would pay huge policy dividends. It would meet new and future reporting requirements, meet myriad needs for program evaluation, and support an environment of data-driven policy making in pursuit of the goal of ensuring a highly qualified teacher in every classroom in America.

Essential Categories of Information

Below, we describe categories of information that states must tap to understand the teacher pipeline. These include: teacher-education programs; alternative certification programs; teacher employment; licensed teachers not currently teaching; and teacher retention.

Data on Teacher Education Programs

To understand who is in the "pipeline" to become teachers, states would need information on who is enrolled in each of the teacher-education programs in the state, both state-supported institutions and private institutions. This information should include the number of students who enter the programs and the number enrolled each year, to provide a sense of the persistence rate. It should also include demographic and educational data on the enrollees, so that states would know the age, racial and ethnic background, and academic credentials of those preparing to become teachers. To provide a complete view of mobility, the system might also include information on the characteristics of those who applied to teacher education programs but were not admitted; this information would inform states about the pathways to the teacher education pipeline.

The data set should also include information on the outcomes of teacher-education programs, specifically the pass rates on state licensure examinations. Although many states administer licensure examinations (such as the Praxis I) upon entry into teacher-education programs, nearly all states with licensure tests administer exams to students who complete the programs. States should have information on how many students pass the examinations, as well as the demographic and educational background of those who pass. Other outcome data, such as post-employment ratings of teacher performance and scores on other third-party assessments could also be incorporated within these databases to provide a wider view of preparation program effectiveness.

Data on Alternative Certification Programs

In addition to traditional teacher-education programs, virtually all states provide alternative routes to certification for recent college graduates, mid-career professionals who may not want to enter teaching through a traditional teacher education program, and teaching assistants who aspire to earn teaching credentials. In many cases, such programs allow candidates to begin teaching after a brief training program, while continuing to take coursework leading to full certification. Often these programs are operated by districts, subject to state approval.

A strong data system would provide information on who is enrolled in such programs each year, along with their demographic and educational backgrounds. It would also include information on the rates at which participants eventually earn certification, and the characteristics of those who do so. By making these data consistent with that collected for traditional teacher preparation programs, states could make vital comparisons about the eventual mobility patterns and other outcomes of both types of programs.

Data on Teacher Employment

To understand the current teacher workforce, state data systems should include a wealth of information on individual teachers and where they are working. This would include the educational background and certification status of current teachers, in which schools and classrooms they are located, their specialties, the demographic characteristics of their students, and the achievement levels of students where permitted by state law.

In addition, the data should include salary information, by location, student demographics, and student achievement. And it should indicate where teachers come from – in the district, outside the district, or outside the state.

The goal should be to help determine whether teachers with the right qualifications are working in the appropriate classrooms. Toward that end, the data systems should also include information on current teaching assignments as well as professional development – whether teachers are upgrading their skills in their subject areas or earning advanced degrees or certification from the National Board for Professional Teaching Standards. Conversely, the number of working teachers for whom standard qualifications have been waived should be monitored from employment data to pinpoint those districts and subjects where attention should be directed.

Data on Licensed Teachers Not Teaching

To provide information on the "reserve pool" of potential teachers, state data systems should include information on the employment status of individuals who hold licenses but are not currently teaching, including those who left the profession and those who never entered teaching in the first place. This data should also include information on the salaries of such individuals. Ideally, the data should also include attitudinal information that could open a window into why such individuals left the profession. By conducting surveys as well as tabulating individual employment patterns, states can learn a lot more about current mobility patterns.

Data on Teacher Retention

To provide information on retention and attrition rates, the data system should include information on turnover rates at each district and school, and should indicate the educational background and certification status of teachers who leave the schools. These data should be captured at systematic intervals, permitting analyses of those who leave the profession on a temporary basis from those whose departure is permanent. Within a given state, such a scheme would also permit policy makers to view the mobility of teachers who transfer from district to district.

Existing State Data Systems

An "ideal" data system on the teacher workforce does not exist. It may not be feasible in all cases. But it is worth laying out what we know from our research so that states can assess their own data systems and begin to improve them. We conclude this section by summarizing how a strong data system to enhance teacher quality might be assembled from key data elements in databases that most states now maintain.

The federal government and the states already collect a wealth of information that could begin to answer these questions. Through its Schools and Staffing Survey, the National Center on Education Statistics collects and publishes a great deal of information on the characteristics and employment of teachers. For example, the survey publishes data on the extent to which teachers' qualifications (specifically, college major or minor) match their assignments (Seastrom et al., 2002). These data can be used by states as a benchmark to gauge their efforts to address "out of field" teaching.

While such information is useful to help states gauge the supply and demand of highly qualified teachers, only state databases that track individual teachers and where they are employed can help states manage their workforce effectively, respond to shortages, and facilitate mobility where it is warranted. As noted above, states already collect a wealth of data on their teacher workforce, and many maintain detailed databases that can help them link supply with demand.

For example, Title II of the 1998 Higher Education Act requires states to gather a great deal of information on teacher preparation. Institutions of higher education must report how well individuals who complete their teacher preparation programs perform on initial state licensing and certification assessments in their areas of specialization and the student-faculty ratio in supervised practice teaching. States, in turn, must report the percentage of teaching candidates who passed certification or licensure assessments – statewide, for each institution, and for each alternative route to certification, as well as the proportion of teachers with waivers from certification requirements, in high- and low-poverty school districts and across subject areas.

Each state maintains, or has access to, three types of data sources to enable them to prepare these reports. These sources include:

(1) "Completer" databases, maintained either at institutions or aggregated by the state, that contain information about individuals who completed teacher preparation programs for specific areas of specialization;

(2) Testing databases maintained by state agencies (or, in some cases, testing companies themselves) that can be used to calculate pass rates; and

(3) State Licensure/Certification databases that may track required assessments and may even have individual test results.

These are valuable sources, but it may not be possible to connect the information in each of them to the others. For example, completer databases may not contain test results and certification databases may lack data about a teacher preparation program and/or area of specialization.

In some cases, states have surmounted these limitations and have created data systems that provide high-quality information about teachers at various stages of their career path, enabling policymakers to understand more thoroughly their teaching force. To get a sense of promising state practices, we surveyed 15 states considered strong in at least one area to understand the current state of their databases, plans for change, and any impediments that exist that might limit their expansion. For example, Tennessee was selected because of its biennial study of teacher supply and demand and its nationally renowned database on the relationship between student

test scores and effective teaching. Our choice of states was admittedly subjective, coming from our reading of the available literature and from suggestions advanced by our Advisory Group (see *Appendix A*).

To ensure consistency, we developed a protocol to elicit comparable information across states. We then interviewed relevant state officials to learn details about the state databases and how they were used. We were particularly interested in the extent to which various state databases were linked to one another, and if not, why that is the case.

The survey protocol asked about seven generic databases that could be used to provide data about key milestones in teachers' career paths. They were:

1. **Completers:** individuals who completed a teacher preparation program in a given year, a database that was created in most states to support Title II reporting under the Higher Education Act of 1998.
2. **Teacher Licenses/Certificates:** individual applicants and holders of teacher license(s) or certificate(s).
3. **Employed teachers:** individual teachers in the public schools of the state, including their employment and compensation history.
4. **Course assignments:** courses taught in the fall and the spring by individual teachers by subject, grade level, and school.
5. **Retirement:** individual contributors to the state teacher retirement plan.
6. **Unemployment Insurance Records:** individuals who are eligible to receive unemployment insurance benefits.
7. **Assessment scores:** test scores of students that might be assignable to individual teachers.

Findings

As expected, we found that the databases in these states are quite extensive and contain a great deal of information on the teacher workforce. Nearly all, for example, have created a completer database for Title II reporting, but few included individuals who completed an alternative teacher training program. Virtually all maintain a licensure database that indicates the characteristics of teachers who currently hold state licenses and the status of new applicants. This information in many cases includes demographic data, licensure test results, field(s)of specialization, and educational background. Frequently missing from the database, however, was more detailed information about the teacher's educational information, such as major field, minor field, overall GPA, GPA in the major etc. This is because college transcripts and other documents were kept in storage, but not on the licensure database itself.

In addition, many states also maintain a teacher employment database that tracks where teachers are currently teaching. These also include demographic data, and many also link to licensure databases so that users can determine the licensure status of currently employed teachers. This link is particularly important for state reporting purposes under No Child Left Behind. Some states also maintain an assignment database that may or may not be separate from an employment database. These databases are used to monitor teaching activity across assignment areas and to address issues such as out-of-field teaching. Many states report that one of the most important uses of the assignment database is to generate mailing lists of teachers in each specialty area.

A number of states have recently produced "snapshot" teacher supply and demand studies by matching teacher education completer database with employment databases. These studies provide policymakers with an overview of the current status of the profession within their states. However, because these studies only represent one slice of time and not trends, their usefulness for predicting future supply and demand and understanding mobility is limited.

We also found that states have almost no information on individuals who have left teaching. While these individuals may still remain in their licensure database, states do not track where they are currently employed. Such information might be available on databases maintained by retirement systems or state unemployment insurance agencies. But if it is, state departments of education do not routinely link to such databases. They thus are not in a position to make informed decisions about what they might do to attract individuals back into the profession.

While the data collection is important, we also found that states vary in how they use their data. Many use this information in creative ways. In Connecticut, for the example, the state databases form the basis of an annual survey of teacher supply and demand the state department of education produces. In New York State, Rockefeller College regularly analyzes the data to determine trends. In one study, for example, researchers found patterns in the distribution of qualified and less-well-qualified teachers. The study also found that salary variations may contribute to the distribution patterns (Lankford, Loeb, and Wycoff, 2002).

Not surprisingly, the survey of states revealed that all states organize their data differently. Their database structures reflect such factors as the structure of state government, changes in software, fiscal capacity, and other factors. In addition, states vary in the extent to which policymakers value policy research in addressing issues of teacher quality and mobility.

Obstacles to Effective Data Systems

While they have struggled with obstacles described in more detail below, states are not ignoring data – and information – sharing around teacher supply and demand issues. Four Midwestern states, for example, worked with the North Central Education Regional Laboratory (NCREL) to complete a study of intrastate mobility of a cohort of new teachers (Theobald & Michael, 2001). This study was limited to a survey of public school teachers within Illinois, Indiana, Minnesota, and Wisconsin. This was the first look that these states had at teacher attrition in their schools from the perspective of teachers themselves. Even though they were unable to track teachers beyond the boundaries of each state, Theobald and Michael's research serves as an example of the work that might be done *inside* an individual state and holds hope that future research can be done *across* state boundaries, even perhaps nationally, to understand teacher mobility.

Other states are engaged in "snapshot" looks at supply and demand issues. Minnesota, for example, recently studied the demand for classroom teachers (Minnesota Department of Children, Families, & Learning, 2001), based on a statewide survey of school administrators. A forthcoming study, sponsored by the Minnesota Association of Colleges of Teacher Education, will address the dynamics of teacher supply. Oklahoma recently completed a study of teacher supply and demand (Oklahoma State Regents for Higher Education, 2002) that linked data provided from that state's department of education with completer data from the state regents of higher education.

While studies like these, which periodically analyze supply and demand, are valuable tools for states as they grapple with investment decisions, policy development can be more ably guided by an understanding of the types of individuals that are entering the profession, who among them are staying, and who are mobile. These studies are only made possible through the careful assembly of longitudinal data.

Our survey indicates that states face a number of barriers in developing and implementing such systems. These concerns parallel those issues found by a separate study of teacher data systems in California (Esch, Shields, & Young, 2002). Our research extends the California findings to other states while delving somewhat deeper into the specific problems that impede better information about teacher mobility.

Our interviews with state informants indicate major concerns as they develop and maintain teacher data systems. These are summarized below.

"Silo" Data Systems

Most of the states contacted for this study use data systems created in the 1970's or 1980's, although some use systems established to address the accountability challenges that arose in the 1990's . These systems were designed to collect information and data to meet narrow purposes that are generally administrative in nature. As such they are not readily adaptable for research purposes without significant effort.

These legacy systems are most often regarded as "silos," because they were never intended to be linked to other databases. Our research found numerous examples of systems that do not talk with each other even when they are housed in the same agency. The problems in linking isolated databases within a given agency are mostly territorial, brought about by the narrowness of the purpose for which a given data set was created. Within agencies, leadership that makes linkages among data sets to produce information critical to decision making and policy would eliminate most, if not all, of this problem. The complexities in linking external data sets, such as retirement system and state unemployment insurance files, with internal datasets multiply these barriers exponentially. Here, too, leadership that speaks to the need to uncover key information to inform planning for teacher mobility and state policy is critical.

Missing Data Elements within Databases

The largest proportion of data within state-level databases is collected directly from school districts, and districts often do not provide all the information states need. School districts, especially large districts, maintain independent data systems that are used both for required data reporting to the state and for their own internal operating purposes. Internal management needs, of course, take precedent over state data needs, especially when trade-offs about what types of information and in what formats need to be made.

State requests for data from school districts frequently distinguish between mandatory and optional elements; this produces confusion among districts and state agencies about the inclusion or exclusion of all data elements and can result in databases with large gaps. In Delaware, for example, data on student test results is submitted to the state department of education by school districts. While relying on data submissions by individual districts might be cost effective, it threatens the quality of the data. States frequently have no way of knowing whether the pieces of information coming from the various districts are comparable. If districts fail to submit their data, the state database may be incomplete or out of date. And while states consider missing data a relatively minor concern, compared with other issues, it remains prevalent in all the states we surveyed.

At the same time, such omissions can plague a data system, especially if certain data are routinely missing each year. States are wholly dependent on districts for the quality of the information they receive since it is impractical that state agencies could survey each teacher and each student, statewide, to arrive at the same end. A practical strategy to correct missing data is simply for states to publish the information that is received, noting where data has not been provided by districts. In our experience, public notice of missing data is a very effective way to ensure that future collection cycles are better populated.

Data Definitions

An important first step in creating a data system is having a data dictionary that both the implementer and those who use the data can use to derive definitions and understand data elements within the system. Our research indicates that few states have taken this step, and as a result, definitional concerns create a significant obstacle to producing information about teacher characteristics and mobility patterns within states. For example, states spend considerable effort attempting to reconcile data elements from different districts that may have similar names but varying meanings. The problem is even more nettlesome across states. Since each state establishes its own criteria for licensure, attempting to compare "licensed" teachers across state boundaries and use the information to examine interstate mobility would be almost futile.

Hardware and Software Compatibility

States report incompatibility of hardware and software as an issue, but contend that it is being addressed as systems gradually are updated from historic "flat file" structures to relational database structures. Most states collect and report a significant amount of data through the Internet. Since web-based data systems use a common and prevalent platform, many of the hardware and software issues involved in the mechanics of assembling and reporting databases have been resolved. However, there are still instances where older legacy systems have not been converted to relational systems, thereby limiting their accessibility by researchers. Connecticut and Minnesota, for example, still maintain teacher certification databases that were built using the "ancient" (in computer lifespans) programming language of COBOL. Since information technology specialists are rarely trained in that language anymore, these databases could quickly become useless if no one is able to operate them. Emerging web-based systems, and state's willingness to provide collection and reporting activities over the Internet, will mean eventual replacement of flat file systems.

Limitations on Programming Resources

Current state budgets would appear to limit new projects that seek to understand teacher mobility. States report that the press of federal mandates and other ad-hoc accountability requests frequently limit staff time that can be directed to studies of teacher recruitment, retention, and mobility. State officials are hopeful, though, that the

urgency of ensuring a match between teacher supply and demand – and particularly No Child Left Behind's requirement for "highly qualified" teachers – will make research on teachers a higher priority in the next few years.

Territorial Concerns about Sharing Data

As mentioned earlier, states report difficulties within and outside of agencies in making data available for research in this (and other) key areas. In our opinion, this territoriality arises from two main sources. First, many state-level database administrators previously have not been asked to participate in efforts to use the data for which they are responsible for other, larger purposes. And in any agency, the tendency to stick to traditional procedures rather than attempt new ones is strong, even when the original purposes of the procedures have been superceded by new demands. Secondly, the issue of teacher recruitment, retention, and mobility up to this point has been a lower priority among state leaders. As a result, there has been little pressure for state officials to work across agencies and create new linkages among them. This situation may change as concerns about teacher quality become more salient and the urgency to deal with them becomes more acute.

Privacy Concerns

Concerns about student and employee privacy have erected very real but potentially unnecessary barriers to sharing personally-identifiable information for research purposes. Fearing misuse of personally-identifiable data, administrators in some states are likely to forbid the use of student or teacher Social Security numbers for research purposes, a vital step in ensuring that data from one source (for example, individuals who graduated from Lincoln State University) can be linked to those from another (those teaching at Washington Middle School).

Some states have tried to overcome this problem by creating unique identifiers for teachers. In Delaware and Minnesota, for example, each teacher in the data system is assigned a unique number. In that way, the state can link information about individual teachers from separate data sets without the politically charged use of Social Security numbers while producing nearly the same result within a given agency. Such systems must be managed carefully to ensure that each number is indeed unique and that the unique number assigned to a given teacher is preserved over time. However, even when such housekeeping concerns are met, the process of assigning unique identifiers can only restrict meaningful mobility research since databases that use unique identifiers cannot be routinely matched with other databases unless those databases also use those same identifiers. This problem is potentially easy to address within a given state, but nearly impossible to surmount across state boundaries.

State statutes only tangentially related to student or faculty privacy can also constrain data sharing. State agencies in New York and Indiana, for example, are forbidden from reporting the associations between teacher characteristics and student achievement. Such prohibitions clearly make it impossible to analyze how a given teacher's students perform, which may or may not be justified, but they also tend to make it difficult to address other legitimate, less highly charged policy and research questions.

Questions about Responsibility

Each state is organized differently, and responsibility for research on teacher quality is not always fixed in one agency. And, there is always the possibility that no person or agency takes responsibility! In some states the teacher certification unit is part of the state's department of K-12 education; in other states it is separate. All states operate separate departments with jurisdiction over retirement systems and planning for the state's labor force. These departments are unlikely to initiate integrated studies of teacher mobility by themselves, but they clearly have a role to play in filling out the larger picture of what happens to teachers within a state's boundaries.

In some states, agencies have taken on the responsibility to cross boundaries. In Minnesota, for example, schools of education have organized studies of teacher supply by matching their production with the perceived hiring needs, as documented by the Department of Children, Family, and Learning, the state's K-12 education agency. Any study of teacher supply and demand must include higher education. When organizational structures or inertia impede efforts to understand the pipeline for teacher quality, leadership and direction from high levels within state government are critical.

Questions about Definitions for Teaching Mobility, Quality, Out-of-Field Teaching, and Other Indicators

The nuances that are attached to these terms serve to prohibit comparative analysis. For example, does "teacher mobility" only refer to those who have left a given job? Or does it extend to those teachers who have transferred to another school district – or to those who have left the profession completely? The definition used by Theobald and Michael (2001) separates teachers into "stayers" (those who serve continuously in the same district for five years after initial hire), "movers" (those who transferred to another district but stayed within the state), "leavers" (those who left public school teaching in a state and did not return), and "returners" (those who left, but returned). These terms add a level of meaning to the study of mobility that typical research, which simply looks at the numbers of persons trained to teach and the number of available job vacancies, cannot match.

The meaning of the term "highly qualified teacher" is still undefined in federal regulation. To many, a qualified teacher is a person who holds a valid certification or license in the subject area that she teaches. Others believe that any teacher who receives a temporary or emergency certification is qualified by dint of that credential. Still others maintain that all teachers must continuously upgrade their teaching competencies, as many states require, before they deserve to be called "qualified." Our research indicates that states are grappling with this issue and that it will have profound effects on teacher mobility issues.

Among the states we surveyed, state licensing agencies are taking the lead in this area. Indiana, for example, is redesigning its certification system. New requirements for continuing licensure will require joint supervision by the local school system, an Indiana college or school of teacher preparation, and the state's Board of Professional Standards. This model, based on competencies developed through the professional standards board, will require new ways of storing data about teacher qualifications. The work in Indiana may provide a framework for others to follow in defining the term "highly qualified teacher."

Similarly, differing definitions of "out-of-field" teaching confound data use and reporting. Common sense dictates that the term "out-of-field" means those teachers that are teaching subject areas in which they are not certified. However, some states define anyone with a temporary or emergency certificate as teaching "in-field." The complexity grows when a given teacher may be "out-of-field" by teaching one or more subjects, but "in-field" for the rest of her or his assignment.

Questions about State-Level Comparability

School districts are concerned about the comparability of the data that they submit to state agencies in the same way that states are concerned about the comparability of their data with other states. Tight definitions for variables as well as consistent usage of data by reporting agencies are goals that can be addressed within states. Such work is time-consuming and iterative; it involves the joint cooperation of school districts and state education agencies to ensure that data are both valid and reliable.

Comparability across state boundaries, however, is a much more complex task. First, states must agree on what data to collect and how the data are defined. Next, states must exercise care so that the data available to state systems are amenable in their current structure to meet the alternate, shared data definitions. An example of how this becomes important for studies of mobility is Theobald and Michael's (2001) definitions of stayers, movers, leavers, and returners. States that do not collect teacher cohort data according to these categories would be disadvantaged in describing their comparative mobility.

A Prototypical Data System

We summarize the potential interrelationships among state-level databases that could operate together to produce comprehensive and longitudinal information about the potential teacher workforce in a given state in Figure 1. The databases within this figure are in common usage across the states we interviewed although they may be titled differently and, in some states, two databases might be combined into a single database. A key point is that employment, assignment, completer, and licensure/certification databases must "talk" to one another to arrive at a general picture of the condition of the teaching profession. Such wide views of the profession could be extended, however, by making use of other databases that most often operate outside a state's K-12 education agency.

Figure 1 calls for linking these external databases to produce more informed research on a state's teaching workforce. Namely, we believe that a comprehensive data system would routinely collect data from unemployment insurance and retirement systems databases, two valuable, but underused information sources. Access to these data would permit policymakers to know what happens to teachers within a state when they leave or "stop out" of the profession (from unemployment insurance databases) and to predict retirement dates and the impact of retirement incentives on individual teacher career decisions.

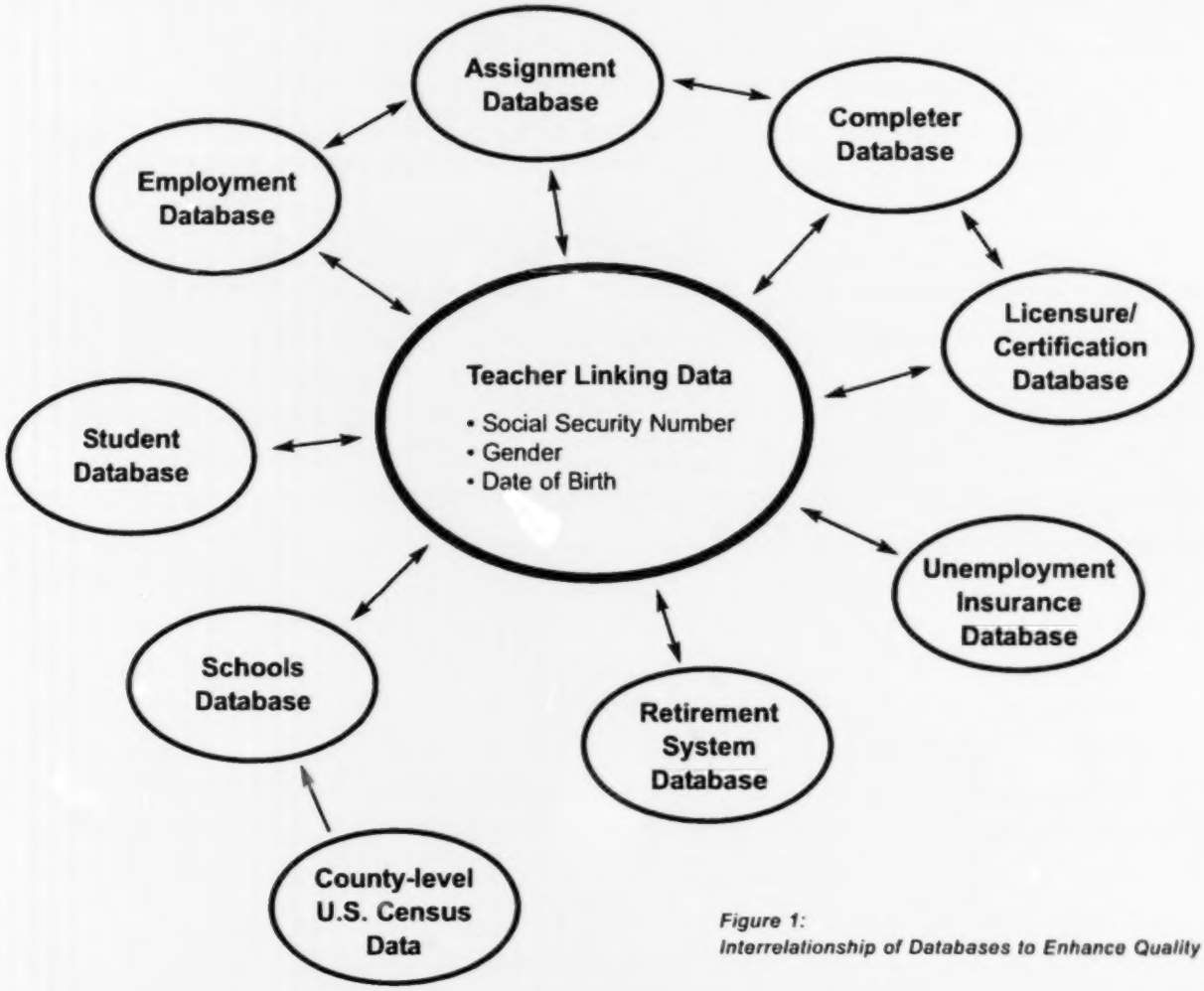

Figure 1:
Interrelationship of Databases to Enhance Quality

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Figure 1 also suggests incorporating other databases that may exist in state K-12 agencies, a student database and a database on schools. Both databases would provide characteristics that can inform both policymakers about the types of schools that attract qualified teachers (including county-level data about the environment in which schools operate, such as average household income, average value of housing units, and education levels) and the types of students within those schools (demographics and achievement scores). Inclusion of student and school databases within a data system may appear superfluous to those charged with answering the initial, basic questions about managing teacher quality. However, there is evidence that at least part of the solution for addressing teacher shortages lies not in recruitment practices but in the school environment, including support and training provided for new teachers (Ingersoll, 2002 & Johnson, et al., 2001).

Appendix C is a compilation of data elements that should be considered when assembling an effective data system. Access to these elements will ensure that states can take a comprehensive view of their teacher pipeline and systematically address issues of teacher quality.

RECOMMENDATIONS

1. States should develop or refine comprehensive data systems that provide information on teacher supply, teacher quality, and teacher mobility.

This information is a valuable commodity without which policy decisions can only be piecemeal. Although states have long maintained data systems to keep track of their teacher workforces, few have developed comprehensive systems that would enable them to manage the workforce effectively and ensure that they can match teacher qualifications to student needs. As a result, states have little information on whether their policies for attracting and retaining teachers are effective.

The urgency for a data system for managing the teacher workforce is particularly acute now, since the No Child Left Behind Act of 2001 requires "highly qualified" teachers in every classroom by the end of the 2005-06 school year. Without knowing what the qualifications of teachers are, where they are located, and how they can move to where they are needed, states will be hard-pressed to meet this federal requirement.

Data systems are rarely high priorities for states in good economic times and even less so when the economy is slow. They may not yield immediate payoff, and they can be costly. But information is critical. Only with information, and the infrastructure to collect and disseminate it, can states ensure that all students have access to well-qualified teachers – a goal all policy makers share. Creating and maintaining effective data systems should be a top priority.

2. To develop effective data systems, a high degree of cooperation among key players is critical. All necessary parties must participate in the data-development and collection effort, and governors and legislative leaders must be supportive.

K-12 Education agencies have typically taken the lead in developing and maintaining teacher data systems. They should be joined by SHEEO agencies, private institutions of higher education, state employment agencies, school districts, and retirement systems to produce routine, systematic information on the teaching pipeline. Unless those efforts are coordinated, the data systems will remain limited.

Sharing responsibility for maintaining data systems makes a lot of sense at a time when virtually all states are facing budget deficits and are looking to cut costs. A coordinated data system is literally greater than the sum of its parts. At the same time, we suggest that small victories are more important than large, sweeping changes among states without a long history of data-sharing. It is important to achieve answers to one or several large policy questions using information at hand than it is to create expectations that cannot be met in the short-term.

It can be challenging to bring together disparate state agencies in the sharing of data and the governor and legislative leaders may need to play a leading role. Ultimately, a strong, effective data system cannot be created and maintained unless their support and leadership makes it a high priority.

3. States should commit the financial and human resources necessary to develop and maintain such a system.

Make no mistake: creating and maintaining data systems costs money. States need personnel to collect and enter the data and keep the system up to date. In addition, state personnel need to analyze the data and make it useful for administrators and policy makers. While nearly all of the data needed is already in place in one or more databases, these databases are seldom connected. The No Child Left Behind Act, however, has accelerated the interest in data across states and most states now are gearing up to meet those reporting requirements. In most

cases, a modest additional investment would integrate existing databases that could inform issues of teacher quality and mobility.

To be sure, states can rely on districts and schools to supply information. But such efforts raise questions about data quality. If the schools and districts do not provide the information in a timely way, the data sets will be inadequate. And the data may not be comparable, if schools and districts use different definitions of key variables. There are precious few alternatives for states other than to collect data directly from districts. Again, we believe the best way to arrive at clean data is to use those data in very public ways. Publication of reports that reveal where data gaps occur can motivate districts to be more attentive to producing critical information.

4. Although the use of Social Security numbers raises concerns about privacy, states should use such numbers in establishing a data system, while maintaining "firewalls" to ensure that the information is not used for any purpose other than enhancing the teacher workforce.

Many states have avoided collecting teachers' Social Security numbers to avoid privacy concerns. In addition, teachers and others are concerned that if states collect such information other entities could obtain teachers' Social Security numbers and commit identity theft.

However, the use of unique unit records is essential in a data system. Without them, the system would be essentially useless; states would have no way of tracking the qualifications and employment of teachers. The best available unique identifier is the Social Security number: every teacher has one, and each one is unique irrespective of location.

Some states have established data systems using Social Security numbers for years, with no material misuse of data. Nevertheless, some states remain reluctant to go down that road. Other states offer only a partial solution: using unique identifiers in place of Social Security numbers. By assigning teachers unique numbers, as a substitute for Social Security numbers, states can ensure that they track teachers across databases that use the same substitute identifiers while avoiding privacy issues. In practice, however, this alternative will only provide a limited picture of teacher mobility, and only within that state. Cross state mobility studies will be impossible.

5. States should make the data from integrated systems available to qualified parties for analysis and these results should be shared with the public so that state efforts to enhance teacher quality are recognized.

While state agencies are vital to collecting data; they need not be the only entities responsible for analyzing data or reporting trends. Indeed, some of the most effective use of data is by researchers with access to raw data sets, who have the time and skills to draw out needed information. Consider the federal Schools and Staffing Survey: while the National Center for Education Statistics conducted the survey and has produced some important analyses, other researchers, such as Richard Ingersoll, have mined the data to produce critical information. At the same time, few studies have emerged along the lines that we suggest in this report because the demand for research on teacher quality and mobility is relatively new and because the data systems that can produce the necessary data are rarely integrated. More integrated data systems and research-friendly policies are essential for helping state and teacher education programs assess the effectiveness of policies and programs in meeting the needs of children for highly qualified teachers.

Unfortunately, in many cases the barriers that have impeded state agencies from linking with other agencies' data sets also impede those outside the government from gaining access to the data. Yet in many cases these obstacles are artificial. Some cite privacy concerns, others cite staffing shortages, and many blame a lack of resources. As we have seen, though, states exercising leadership have overcome these barriers. States need to ensure that information that can inform critical policy is made readily available to researchers and that the results of such research are used. This would not only improve the flow of information, it would also improve the quality of the data; the more frequently that the public has access to information from these data, the cleaner than they are likely to be.

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Appendix A:

Panelists
Data Systems to Support Teacher Quality

Joseph Aguerrebere
President
National Board for Professional Teaching Standards

Past Deputy Director,
Education, Sexuality and Religion Unit
Ford Foundation

Gary T. Barnes
Independent Contractor

Julie Davis Bell
Education Director
National Council of State Legislatures

Charles Coble
Director, Teacher Quality
Education Commission of the States

Lynn M. Cornett
Senior Vice President
Southern Regional Education Board

Bridget Curran
Senior Policy Analyst
Education Policy Studies
National Governors Association

Richard Ingersoll
Professor
Graduate School of Education

Dale Janssen
Director, Certification, Assignment and Waivers Division
California Commission on Teacher Credentialing

Sabrina Laine
Associate Director
North Central Region Education Laboratory

Julia Lara
Deputy Executive Director
Council of Chief State School Officers

Tod R. Massa
Director, Institutional Research & Technology Services
State Council on Higher Education

Robert Reichardt
Senior Researcher
Mid-continent Research for Education & Learning

Diana W. Rigden
Vice President
Council for Basic Education

Robert Rothman
Consultant

Richard A. Voorhees
Principal
Voorhees Group

Appendix B:

State Profiles

Connecticut

Connecticut maintains a teacher certification database and an employment database, known as the Certified Staff File, which are linked to one another, enabling state officials to determine where licensed teachers are employed, and if they are appropriately certified to teach. To enable this link, the state uses teachers' Social Security Numbers, which ensures that they are able to follow the same teacher in each database.

The certification database includes teacher demographic data, a record of their licensure area and scores on state licensure tests, and the name of the institution or agency that prepared the teacher for certification, if it was in Connecticut. However, the database does not include the teachers' major or minor or grade-point average.

The Certified Staff File, which was mandated by state statute, includes information on teachers' experience, race and gender, their salary, the grades they are teaching, and the percentage of time they spend teaching each subject. It also indicates whether teachers have taken leadership roles, such as department chair or curriculum coordinator.

State officials say the linked databases have proven useful as management tools. Districts provide the information, which is compiled in school profiles. These profiles provide data on teacher quality and student performance, and are used to make a variety of policy decisions. In addition, the state department of education uses the data for an annual survey of teacher supply and demand.

Despite this value, the database does have some limitations. One of the most significant is technical: the certification database uses COBOL, an old software language that few people use anymore. Once current administrators get replaced by a newer generation, state officials say, few people will know how to maintain the database.

In addition, there are limits to the data the systems provide. By including information only on in-state teacher-preparation in the certification file, the database does not enable administrators to track the background of teachers who may have been prepared in other states.

Delaware

The Delaware Department of Education employs a computer system known as the Delaware Educator Data System (DEEDS). This system enables administrators to track persons who are teaching in Delaware's schools, where they are from, and what area they are teaching. This system includes a certification database, an employment database, and a teacher assignment database that are linked to one another using a unique code for each teacher – not their Social Security Number, but a "surrogate" number that serves the same purpose without creating the possibility of invasions of privacy. Delaware is also planning to link a student assessment database to DEEDS, which would enable users to see the test scores of each teacher's classes.

The certification database includes teacher demographic data, information on their licensure area, scores on licensure tests as well as indicates the degree teachers earned. Delaware is planning to add data on their major and minor field of study.

The employment database charts a teacher's employment history. It includes demographic information, and teacher assignments, including whether the teacher is teaching a special class (such as Title I). This database

is linked to the certification database, so that the state can identify the licensure status and preparation the teacher received.

The Delaware Department of Education also maintains the Delaware Educational Personnel Statistics (DEPS) a database that is populated from the state payroll database Payroll/Human Resource Statewide Technology (PHRST). DEPS can be linked to DEEDS for required reports.

Florida

Florida is in the process of building a K-20 education data warehouse that promises to provide "real time" information on a variety of educational research and planning issues (http://edwapp.doe.state.fl.us/doe/). The warehouse will extract multiple-year data from established operational systems, including a mature P-12 data system, and data from the well-established community college and university systems. Described by staff as a "student-centric" system, the warehouse links data about education staff, awards, courses, institutions, and financial aid to permit analysis of the impact of the educational process on students. Because the warehouse contains historical records since 1995, it will be possible to quickly profile the mobility patterns of teachers within Florida. When complete, the warehouse will provide even more detail, customized to answer specific questions. Because it is linked to higher education programs, researchers will be able to gain new knowledge about those who complete teacher education programs but do not enter the profession. For those who enter teaching, the warehouse can produce even more granular detail about their demographic characteristics, the types of schools at which they were employed, levels of certification, the types of courses they taught, and the types of students they taught. The outstanding feature of the data warehouse is that it permits nearly instantaneous responses to policy questions without the sometimes long and laborious process of requesting, editing, and merging operational systems.

Georgia

In many respects Georgia is a model for comprehensive data collection on teachers. In response to the Quality Basic Education Act in the mid-80s the state revised its basic data collection on teachers. In the mid-90s, it created a Professional Standards Commission and a separate Council on School Performance that expanded the offerings of student assessments. In 2000, the Georgia Legislature passed an omnibus education reform bill that required a range of school accountability measures including public web accessibility to student test scores and other performance indicators. However, the change in governorship has put some of the 2000 reforms in question.

The information technology unit of the Georgia Department of Education manages two major databases on teachers that support teacher reporting activities: a certification file collected by the Professional Standards Commission (PSC database); and a file on Certified and Professional Staff (CPI database) employed in Georgia's public schools. The latter is a comprehensive file that is collected through a web-based system that connects all public schools and districts and provides instant data editing to those submitting the data. The CPI is collected once in the fall, the spring and the summer and contains information on the teaching assignments reported by FTE and subject taught. The summer data collection gathers data on the leave accumulated by teachers. The CPI is divided into four parts: the first contains identifying information (SSN and an optional ID number used by the local school district) and other demographic information; a salary distribution database that identifies the school that employs the teacher, the total salary paid and the sources and basis for that salary; an assignment database that shows the percent of time devoted to each subject and course assigned to the teacher; and a portion on leave records. The assignment data are used to calculate out-of-field teaching, but they do not contain information on the teacher's major or minor in college, grade point average or other educational experience data. The data dictionary for the CPI and the state salary schedule are both available online.

The University of Georgia Board of Regents provides a completer file on students who have completed student teaching to the Professional Standards Commission. Known as the Capstone File, it has been used for Title II reporting and for Georgia's ongoing study of teacher supply and demand. The Board has been concerned that teacher production by its institutions is understated by these data and is launching an effort to build a more accurate file of completers. Primary responsibility for monitoring teacher supply and demand in Georgia, including teacher turnover and mobility, is assigned to an Office of Teacher Workforce Research and Development.

All teachers in Georgia must participate in the state's teacher retirement system. The state's Department of Labor maintains its unemployment insurance data, but has thus far not integrated that data into a teacher-tracking database. However, a comprehensive P-16 tracking initiative that was started about five years ago may tap these data if its database is completed-a task that has stalled with the recent change in administration.

Illinois

Illinois maintains two databases with teacher information, the Teacher Certification Information System (a relational database) and the Teacher Service Record (a historical system in flat file structure). The former contains information on all teachers (with the exception of charter school teachers who are not required to be certified) and the latter only on public school teachers. There is discussion about re-establishing a data warehouse after early efforts failed. The quality of data submitted by teacher education programs is a concern. There also is some reluctance to share data both internally and externally. Illinois, like other states, is wrestling with what defines "out-of-field teaching." The use of paraprofessionals in the state and their certification status has become a significant issue.

Illinois reports some usage of unemployment insurance databases to project future attrition of teachers. Unemployment data are also used to confirm low teacher attrition reported by individual school districts. Illinois records teacher licensure test data as either a "pass" or "fail," a choice that may impede future year's efforts to compare applicants if tests change or are recalibrated.

Indiana

Indiana's teacher certification agency is separate from its K-12 agency, the Department of Public Education. Completer, employment, assignment, and student testing databases are maintained by the K-12 agency. There is a desire to collect information about teacher assignment in both the fall and spring to provide a total picture of teacher activity across the entire year. Statute prohibits the agency from research linking the student testing and teacher databases.

The Indiana Department of Public Education maintains an extensive, web-based data collection and reporting mechanism. The public is able to view statewide trend data about student achievement, the number of certificated personnel and minority teachers, and average teacher salary. The Department also maintains the "Indiana Accountability System for Education Progress," which reports the results of accountability reporting by school corporations. Teacher turnover is not currently a reported data element.

One of the largest mobility issues in Indiana is the fact that local school districts (called "corporations" in Indiana) set their own salary scales. Teachers that have 3 to 5 years experience frequently find it difficult to make a lateral move to other districts since it is more cost-efficient for districts to hire new teachers at significant salary savings. There is also no differential salary structure within the state that would reward teachers in hard to staff schools or those teachers with credentials in fields where there are shortages.

Kentucky

Known for its educational reform initiatives growing out of an educational equity suit in 1990, Kentucky has worked steadily to create an environment of educational accountability and quality improvement. A focus of this effort has been its development of data on out-of-field teaching, an effort that has forced it to link its key databases on teachers and to develop an enterprise system for distributing access to this information. The new system is an Oracle database that runs on PC servers and connects data from its old DB2 databases on certification (under the Educational Professional Standards Board, EPSB), and employment and teaching assignments (the Personnel and Staff Data system, PSD). Named MAX, the new system includes a student information system that can be aggregated to the school, district or state level. It regularly receives student, course and scheduling information directly from local sites through an on-line PC network. These databases are designed and maintained by a separate Office of Educational Technology (OET). A statewide financial management system (MUNIS) is used to

distribute and account for salary and other state-appropriated funds. It includes information on the school and district where the teacher is employed and the salary paid to each.

Data on completers are provided in aggregate form by individual institutions in order to satisfy Title II reporting requirements. It is not clear, however, whether unit record data on students completing teacher education programs at postsecondary institutions are available to staff in the Kentucky Department of Education. State end-of-grade and end-of-course test data on K-12 students are available in unit record format, but test results are not released at the school or district level. It is unlikely that test scores could be linked to teachers given the security arrangements that surround the testing database.

It summary, Kentucky has all of the unit record databases needed to track teachers except a completer database. Records in all databases include the social security number as the personal identifier.

Minnesota

The Minnesota Department of Children, Families, and Learning (CFL) maintains a relational database (called "STARS") which merges both a teacher employment database and an assignment database. The licensure/certification database is a legacy COBOL system which can be linked to STARS with extra programming effort. STARS is fed by routine reporting by school districts allowing CFL staff to report the characteristics of teaching staff, both professionals and paraprofessionals, in each school within the state. Included data elements are years of experience, average age and salary, and percent of teaching staff with highest level of education (bachelors, masters, or other) extending back to the 1989-1990 school year.

The legislature has required CFL to submit a report on teacher shortages since 1999. Consistent with predicted shortages in other states, Minnesota anticipates shortfalls in special education, mathematics, technology education, and foreign languages. Minnesota reports the names and certification status of teachers on the CFL website. To facilitate the tracking of teacher assignments staff have recently made the decision to collapse the 400 plus teaching codes into a more manageable categories. CFL Minnesota uses a "folder number" to link databases internally.

Out-of-state teachers can purchase years in the Minnesota Retirement System, based on their credited teaching years elsewhere; current vestment threshold is three (3) years in most cases. However, all provisions for purchasing service credit currently are scheduled to expire on May 16, 2004.

Mississippi

An early recognition of the need to reform public education in Mississippi and a series of programs and initiatives to improve school performance and teacher quality have produced a state level data infrastructure on teachers that is balanced and effective. Consisting of a completer database, an updated employment and teaching assignment database (formerly PERSACCR), a certification database, a testing database under the Office of Student Testing, and a newly adopted Mississippi Student Information System (MSIS) that are all under the control of the Mississippi Department of Education (MDE), the State has addressed its internal and external reporting needs directly and efficiently.

The completer database is used for Title II reporting and its data elements are defined and collected by a separate office in the MDE. The office works directly with individual colleges and universities to collect and edit the data rather than working with the Mississippi Board of Trustees for Institutions of Higher Learning. The database contains individual records of students who have completed teacher education programs. The social security number is used as the identifier on this database and on all others.

In 2001, the MDE installed a new on-line student reporting system, MSIS that also includes information on teachers. The teacher data includes the information that was previously reported through the PERSACCR database – name and demographics, school where employed and salary paid, as well as course assignments including vocational

and special education assignments. The student and teacher data are all entered at the local level and edited at the time of submission. Reports generated from MSIS data are available on-line to local and state officials.

Separate offices for teacher licensure (Office of Educator Licensure), Student Testing, and a Mississippi Teacher Center handle licensure and certification, student testing and school accreditation, and teacher recruitment programs, respectively. The Office of Educator Licensure is highly regarded for its rapid response to applicants and for its ability to retrieve all documents submitted by applicants from its scan and store pc server database. Although separate from other teacher databases, the licensure data are available to other MDE offices and are summarized through reports prepared by the MDE Office for Statistics. The Office of Student Testing includes NAEP, end-of-grade and end-of-course test scores and has the ability to link students' test scores to their teachers. The Mississippi Teacher Center maintains information about job vacancies, job fairs, recruitment incentives, teacher training programs including alternative programs offered by community colleges and school districts, and other programs related to teacher recruitment.

Data sharing appears to be an important part of the culture of the MDE. In addition, its small size, its up-to-date MSIS, and the integration of its data reporting and database management under a single Management Information Systems Office all seem to make its teacher databases readily accessible for the analysis of teacher mobility and teacher quality issues.

New York

The New York State Education Department has maintained databases on teachers for decades. These include a program completer database, which includes names and demographic information, institution, test scores, and proposed certification area for people who have completed a teacher preparation program at public and private colleges and universities and selected alternative programs; a teacher certification database, which includes information on those who have received state certificates; and an employment database, which includes records on teachers who are currently teaching.

Rockefeller College regularly analyzes data from the system to study trends in employment. Such reports can identify trends in the placement of relatively inexperienced teachers, for example.

However, the databases are limited because of some omissions. The certification database does not include complete information on teachers' race and ethnicity. Race and ethnicity information is optional and not all people choose to complete this category. Nor does it include certain information on the academic background of teachers, such as their major or minor field of study. However, it does include the name of the institution where they received their degrees, degree titles, and test scores.

The Education Department does not currently have the capability to link any of the teacher databases with student assessment databases. Thus the State does not report on the student test scores of individual teachers' classes.

North Carolina

Numerous educational improvement programs over the past 17 years, along with a tradition of heavy state involvement in public education, have helped North Carolina build and maintain good data on teachers at the state level. This data infrastructure consists of a four year old file on completers at public and private colleges that is used for Title II reporting and a separate state report card on teacher education programs; a twenty year old licensure and salary file that provides licensure, employment and salary data on teachers; a fifteen year old Student Activity Report (SAR) file that provides information through its Student Information Management System (SIMS) on teacher assignments in the fall and the spring; a retirement file maintained by the State Treasurer for all teachers; a Common Follow-Up File that tracks newly trained teachers into jobs reported on the State's Unemployment Insurance File, and a comprehensive state testing file that includes end-of-grade and end-of-course test scores and an identifier for the teacher in each grade and course tested. The test file is partly the result of legislation to

create an Accountability, Basic Skills and Local Control Program (ABC) in 1997. Although they are not part of a relational database, all files can be connected by means of the teacher's social security number.

The core database is the one on teacher licensure and salaries. It contains information about all licenses held; whether the licenses are active or inactive; a history of licensure test scores and dates when tests were taken; the colleges and universities attended and the degrees earned at each; thirty years of employment history in the public schools; state salary paid in the current year; and other personnel information such as race-ethnicity and gender. The database does not include data on teachers' majors, minors, grade point averages or courses taken while in college, nor does it contain information on locally paid salary supplements, bonuses or stipends, or information on the types of professional development activities completed to renew their licenses. The SAR file contains detailed information about the courses taught, class sizes, subject codes, course types, course schedule, and the FTE attributable to each teaching activity. By combining data from the licensure and salary file with the SAR, the State is able to build its reports on out-of-field teaching.

Despite the comprehensiveness of the teacher data obtainable from these files, the State Department of Public Instruction (DPI) is enriching its databases by converting to a new data warehouse of networked data centers fed by local districts. Named NC WISE (Window of Information for Student Education), it is scheduled for a three-plus year phased installation with the first set of school districts completing the testing phase in 2002-03. When complete, WISE will replace SIMS and will become the new source of data on teacher assignments. However, the certification and salary database will not be a part of WISE. Unfortunately, the demands of building the new system and of meeting new reporting requirements have come at the very time that DPI has lost staff and funding. This has meant that the potential to exploit the policy analytic capabilities of its teacher databases has not been fully realized. The agency is planning to add some data elements that will be needed for No Child Left Behind reporting requirements on teacher quality. It notes that its major impediments to building a comprehensive database to achieve its goals are all related to staffing and resources levels.

Oklahoma

Oklahoma reports significant progress in education reform. A recent report from the Department of Public Education indicates that the state ranks 8th nationally in the number of teachers who have achieved national certification credentials and ranks 5th nationally in improving teacher quality. The Department regularly reports statewide statistics on the number of certificated teachers including their level of preparation.

Oklahoma operates a separate teacher testing database maintained by the Teacher Preparation Commission. The Department of Public Education also operates a separate, "siloed" database to track teacher professional development. Thus, there are at least five databases (these two and the certification/licensure, employment, and assignment databases) that might be candidates for integration to produce a comprehensive view of teacher quality in Oklahoma. Difficulties in using data reported in Oklahoma include uncertainty about sharing data and questions about definitions of teacher quality. Districts use SSN's to generate data but the state issues certificate numbers; this complicates data matching.

A teacher supply and demand study has been recently completed in cooperation with the department of public instruction and the state regents (OSRHE, 2002). This study followed a similar study completed in 1998 and, like its predecessor, found no shortages in the production of teachers and concluded that shortages arise in geographical areas and in certain subjects because of the inability of schools to hire and retain teachers. Low salaries, difficult work environments, and more attractive job opportunities in other fields cause many trained teachers to select other careers. This report recommends that teachers should be paid salary supplements in high demand subject areas and in low supply geographic sections of the state and that the state consider initiating and expanding alternative financial incentives to attract students to teaching.

Tennessee

The data structure needed to track teacher mobility is largely in place in Tennessee. It has participated in the SREB teacher supply and demand study since the mid-80s, built what is arguably the best test score database (the

Tennessee Value Added Assessment System-TVAAS) in the early 90s, and has built all of the generic databases covered by our analysis. Despite these steps, however, considerable work remains before the system can be integrated and focused on issues of teacher recruitment, retention, and mobility.

A database on teacher education program completers at public and private colleges and universities and a separate database on licensure and certification are both coordinated by a single office in the Tennessee Department of Education (TDE). The completer database is used for Title II reporting and is prepared for the TDE by the Tennessee Higher Education Commission (THEC). It does not contain information on persons who complete alternative certification programs in Tennessee, nor does it contain information on the level of the degree earned (master's versus baccalaureate), the student's minor field of study, or the grade point average in the major. Even though it contains information on each completer's primary and secondary majors in college and an overall grade point average, no educational attainment data are carried forward and stored on the certification and licensure database. Instead, virtually all of the data on educational attainment is microfilmed for storage once the decision about eligibility for a teacher license has been made. Similarly, data on professional development activities are microfilmed once decisions about licensure renewal have been made. Thus, the database on completers and licensed teachers contains little usable information about the educational attainment of teachers in the Tennessee public schools. Matters are made worse by the fact that the certification and licensure database is an old flat file structure that is written in COBOL and not compatible with the Oracle databases used by schools and districts to report on students, course assignments and other teacher data that are part of the statewide Education Information System (EIS). In part because of software compatibility, the data on course assignments are kept by a separate office within TDE and are not merged with data on teacher employment and salaries.

An employment database is operated and maintained by the finance unit of TDE and is used to make salary disbursements to teachers from state appropriations. It is largely a single purpose database that is not connected to other databases on teachers. Like other databases on teachers, it identifies teachers by social security number or teacher license number, which makes it difficult to connect data in this database to other teacher databases. Despite these limitations, it is useful because it contains salary, experience and employment history information on teachers dating back to the 1960s.

Tennessee received a federal teacher quality grant to examine and take steps needed to restructure their teacher databases for purposes of tracking teachers and assessing teacher quality. The requirements of the grant and of No Child Left Behind, have caused them to recommend a number of modifications to their teacher databases including the conversion of the certification and licensure database to an Oracle format in order to match the state's Education Information System. The State wrestles with issues of how to define "highly qualified teachers" in middle grade schools, how to integrate TVAAS data into teacher assessments, and how much data to put into a new data warehouse that is part of its EIS. Its major limitations in completing work on an integrated teacher mobility system are: 1) resources, given the serious tax revenue shortfalls in the State; and 2) coordination of the many organizational divisions that share responsibility for deciding the content and access to teacher databases.

Wisconsin

Wisconsin collects information on program completers from public, private, and alternative programs that prepare teachers. Demographic information on race and ethnicity is not maintained in either the completer or certification database. The certification database also does not contain data on licensure test scores or the number of times an applicant sat for that test. Wisconsin also recently created an employment database distinct from the certification database that includes all employed teachers within the state, including charter schools, and is designed to provide a complete employment history including salary for Wisconsin teachers. Similarly, the state has recently assembled an assignment database that details the subjects areas taught, their grade level, and the percent of FTE for each teaching activity. Wisconsin reports they will be modifying their databases to meet No Child Left Behind requirements including the areas of teacher quality, teacher demand, and "out-of-field" teachers.

Recent studies conducted by the Department of Public Instruction indicate that the number of program completers from Wisconsin teacher training institutions decreased by 2.7 percent from 1999-2000 to 2000-2001. Program

completers in elementary education decreased 10.5 percent. Attrition rates of existing teachers also are sharply increasing in Wisconsin resulting in increased attention to supply and demand issues and the state's ability to manage the teacher workforce.

APPENDIX C:

DATA ELEMENTS TO MANAGE TEACHER QUALITY

Element	Purpose	Desired Location within State Databases
Social Security Number	Linking Data	All Databases
Gender	Linking Data	All Databases
Date of Birth	Linking Data	All Databases
Race/Ethnicity	Linking Data	All Databases
Certification-Licensure Area	Identifies area of preparation	Certification-Licensure, Completer, and/or Employment
Institution Awarding Certification-Licensure	Distinguishes among teacher preparation providers, including out-of-state providers	Certification-Licensure, Completer, and/or Employment
Program Type	Distinguishes among baccalaureate, masters, certification only programs, and alternative certification programs	Certification-Licensure, Completer, and/or Employment
Major Field of Study Underlying Certification	Matching of preparation to type of certification awarded	Certification-Licensure, Completer, and/or Employment
Minor Field of Study	Matching of preparation to type of certification awarded	Certification-Licensure, Completer, and/or Employment
Grade-Point Average, Major Field	Comparison of quality within teaching area	Certification-Licensure, Completer, and/or Employment
Grade-Point Average, Overall	Comparison of quality within overall degree	Certification-Licensure, Completer, and/or Employment
Year of Degree Completion	Prediction of longevity within field and the length of time expired since formal degree-based training	Certification-Licensure, Completer, and/or Employment

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Element	Purpose	Desired Location within State Databases
Dates of Licensure	Prediction of longevity within field and future professional development or recertification requirements	Certification-Licensure, Completer, and/or Employment
Licensure Test Specialty Area(s), Scores and Number of Attempts	Third-party comparison of successful and unsuccessful teaching candidates	Certification-Licensure, Completer, and/or Employment
Other Assessment Data	Source of additional third-party quality assurance	Certification-Licensure, Completer, and/or Employment
Status of National Board Certification	Third-party assessment of teacher quality	Certification-Licensure, Completer, and/or Employment
Current Year's Teaching Status	Determine current distribution of teachers within state by all data elements	Certification-Licensure and/or Employment
Previous Year's Teaching Status	Examine turnover	Certification-Licensure and/or Employment
Years Teaching Experience, In-State	Analysis of teaching patterns and prediction of turnover	Certification-Licensure and/or Employment
Years Teaching Experience, Other States	Broad analysis of teacher in-migration	Certification-Licensure and/or Employment
States Previously Taught	Granular analysis of teacher in-migration	Certification-Licensure and/or Employment
Participation in Continuing Education and/or Professional Development	Indicator of recertification status and level of professional commitment	Certification-Licensure and/or Employment
Status as Master Teacher or Mentor	Number of experienced teachers engaged in professional development	Certification-Licensure and/or Employment
Participation in Mentoring	Involvement in mentoring as a new teacher	Certification-Licensure and/or Employment
Participation in Induction	Involvement in formal induction program as a new teacher	Certification-Licensure and/or Employment
Base Salary	Accurate statewide averages and comparisons between districts	Employment
Salary From Non-Classroom Activities	Analysis of non-classroom, school-based activities	Employment

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Element	Purpose	Desired Location within State Databases
Total Compensation	Comprehensive salary comparisons, statewide	Employment
Percent of FTE Assigned to Teaching	Analysis of total contact time with students	Assignment and/or Employment
Courses Taught in Current Year by Subject and Grade	Comparison of certification status and teaching activity	Assignment and/or Employment
Level of Course Difficulty (Remedial, Honors, Advanced Placement, etc.)	Comparison of teaching activity	Assignment and/or Employment
Class size	Relationship of class size to other input variables collected	Assignment and/or Employment
Total years Credited to retirement	Prediction of teaching longevity	Retirement Systems and/or Employment
Years in-state credited teaching service	Prediction of teaching longevity	Retirement Systems and/or Employment
Years other-state credited teaching service	Analysis of teacher in-migration	Retirement Systems and/or Employment
Years other credited service	Analysis of previous non-teaching employment on teacher entry	Retirement Systems and/or Employment
Quarterly salary outside teaching	Track teachers who hold more than one job or who have left the profession (within state only)	Unemployment Insurance
Student demographics	Comparison student progression and other demographic factors on teacher quality issues	Student Database
Student assessment Scores	Analysis of student achievement on teacher quality issues.	Student Database
School characteristics	Comparison of school wealth, faculty to student ratios, administrative turnover, and professional development activities on teacher quality issues	Schools Database
School environmental characteristics	Analysis of income, housing, and other environmental characteristics within the school's county on teacher quality issues	Schools Database

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Appendix D:

SHEEO/ECS National Advisory Committee on Teacher Mobility

Joseph Aguerrebere
President
National Board for Professional Teaching Standards
Past Deputy Director,
Education, Sexuality and Religion Unit
Ford Foundation

Michael Allen
Project Manager, Teacher Quality
Education Commission of the States

Michael Baer
Senior Vice President
American Council on Education
Center for Policy Analysis, PRESNET

Joan Baratz-Snowden
Acting Director, Educational Issues Dept.
American Federation of Teachers

Buzz Bartlett
President & CEO
Council for Basic Education

Julie Davis Bell
Education Program Director
National Conference of State Legislatures

Barnett Berry
Executive Director
Southeast Center for Teaching Quality
University of North Carolina

Hans Brisch
Chancellor
Oklahoma State Regents for Higher Education

Molly Corbett Broad
President
University of North Carolina-General Administration

Gina Burkhardt
Executive Director
North Central Regional Educational Laboratory

Thomas Carroll
Executive Director
National Commission on Teaching & America's Future

Betty Castor
Former President
National Board for Professional Teaching Standards

Charles Coble
Vice President for University-School Programs
University of North Carolina-General Administration

Lynn M. Cornett
Senior Vice President
Southern Regional Education Board

Edward Crowe
Consultant

Terry Dozier
National Teacher in Residence & Assoc. Prof.
School of Education
Virginia Commonwealth University

Karin Egan
Program Officer, Science, Tech & the Economy
The Carnegie Corporation of New York

Leslie Graitcer
Executive Director
Bell South Foundation

William R. Holland
Commissioner of Higher Education
Rhode Island Board of Governors for
Higher Education

G. Thomas Houlihan
Executive Director
Council of Chief State School Officers

Gayla Hudson
Director of Teacher Quality
National Education Association

David G. Imig
President
American Association of Colleges for Teacher Education

John Jensen
President
National Council on Teacher Retirement

Deb Jensen
Assistant Director
North Dakota Education Standards & Practices Board

Kathy Klock
Program Officer, Education
Bill & Melinda Gates Foundation

Paul E. Lingenfelter
Executive Director
State Higher Education Executive Officers

Dane Linn
Director, Education Policy Studies
National Governors Association

David A. Longanecker
Executive Director
Western Interstate Commission for Higher Education

Carmel Martin
Chief Education Counsel
Health, Education, Labor & Pensions Committee
U.S. Senate, Jeff Bingaman's Office

Jean Miller
Director, INTASC
Council of Chief State School Officers

Frank Murray
President
Teacher Education Accreditation Council

Diane Oakley
Vice President
TIAA-CREF

Michael Poliakoff
President
National Council on Teacher Quality

Frank Ready
Executive Director
Public Employees' Retirement System of MS

Robert Reichardt
Senior Research Associate
McREL

Diana Rigden
Vice President
Council for Basic Education

Virginia Roach
Deputy Executive Director
National Association of State Boards of Education

Sharon Robinson
President
Educational Testing Service
ETS Educational Policy Leadership Institute

Esther M. Rodriguez
Director of Development
Education Commission of the States

Ted Sanders
President
Education Commission of the States

Shirley Schwartz
Director of Special Projects
Council of the Great City Schools

Sam Swofford
Executive Director
CTC - California Commission on Teacher Credentialing

Arthur E. Wise
President
National Council for Accreditation of Teacher Education

Peggi Zelinko
Special Assistant on Teaching
Office of Vocational and Adult Education, U.S. Department of Education

SHEEO

State Higher Education Executive Officers
700 Broadway, Suite 1200, Denver, Colorado, 80203-3460
(303) 299-3685
www.sheeo.org

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